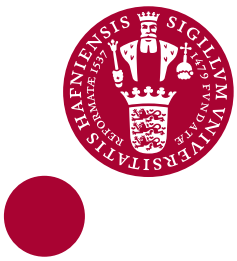

Alternating partial root-zone irrigation: a strategy improves water and nitrogen use efficiencies in row crops

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ABSTRACTS

Shanghai Academy of Agricultural Sciences
Shanghai Agrobiological Gene Center

L 3.05 - Alternating partial root-zone irrigation: a strategy improves water and nitrogen use efficiencies in row crops

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Water and nitrogen (N) are essential resources for crop production, and their availability has predominant effect on crop yield and quality. Shortage of irrigation water is an important limiting factor in crop production worldwide, and with the projected climate changes it is becoming more significant in the future. N fertilizer is one of the most energy-consuming chemical products, however the utilization efficiency of N fertilizer applied to the field is still low. Therefore, there is an urgent need to develop strategies to use water and N more efficiently in line with principles of sustainable development. Alternate partial root-zone irrigation (PRI) is a novel water-saving irrigation strategy which involves irrigating only part of the root zone leaving the other part to dry to a predetermined level before the next irrigation. The physiological basis for improved water use efficiency (WUE) under PRI has been intensively researched; the mechanism is that PRI allows the induction of the ABA-based root-to-shoot chemical signalling system to regulate growth and water use and thereby increasing WUE. In addition, the drying and wetting cycles in the soil imposed by the PRI will influence crop root growth and activity as well as soil bio-physicochemical processes, which may affect the soil nutrient availability and root nutrient uptake efficiency. An enhanced crop N uptake under PRI has been reported in several crops. Based on these findings, it is suggested that PRI may be a promising management strategy improve both water and N use efficiencies in row crops.